

REMARKS

Presently all claims 1 to 14 have been rejected for the reasons noted in the office action dated 12/29/2006. Claim 1 has been previously amended and claim 10 has been canceled.

Response to Examiner's Comments on Prior Amendment:

The Examiner states with respect to claim 1, on page 2, "The examiner must respectfully point that the requirement in the claim is that the radiation leak at at least one location along the length of the fiber is satisfied by the exiting of the radiation at the fiber end,"

The applicant strongly reminds examiner that the use of the term "leak" is a term of art in the optical fiber industry and that it does not include the interpretation of the examiner. Light does not "leak" out of the end of the optical fiber. In the state of the art, an optical fiber is used to transmit light from its input end to its output end with as little loss as possible. Just as a hose is used to transfer water from a source general to an output device, a sprinkler or sprayer e.g., if water is lost along the way, it is said to 'leak out'. Or conversely, the hose is said to be 'leaky' or to be leaking. Optical fiber are generally designed in a similar functional manner. Losses along their length are called 'leaks' or the modes which are lost along the length rather than reaching the output end are called 'leaky modes'. Thus in the field of fiber optics it is well-known, understood and accepted that a 'leak' along the length of a fiber cannot be equated with light exiting the output end of the fiber. Words, commonly used in an art, cannot be interpreted differently from their normal use without specific instructions by the applicant that defines a different meaning within the specification.

In support of these assertions by the application, applicant has attached several documents. See Exhibits 1 to 3, and in particular Exhibit 1 indicating that high order modes may "leak" out where there are bends such that the light is incident at an angle

greater than the critical angle. The cut end of an optical fiber is not a bend. Therefore, the applicant believes that the third element of claim 1 requiring, “selectively leaking irradiation” is certainly not made obvious by McDaniel who only discloses the conventional outputting of radiation by any of the fiber optic devices shown. See, for example, figures 19 and 23.

As examiner knows since applicant in earlier discussions with him introduced him to the Dabby reference, the Dabby reference mentions the word “oligimode” waveguide, Col. 5, line 27, but rather is primarily concerned with a single mode fiber or attenuation of a second order mode which results in a “virtual single mode” fiber. Col. 6, lines 21 to 29. Such a view is supported by the claims of Dabby in that “means for attenuating modes higher than the primary” are a part of the independent claims. He does not indicate any reason or benefit from using an oligimode fiber.

As to the motivation of combining the teachings of McDaniel and Dabby, the Examiner states, on page 2, of the office action of 6/28/2005, “it would have been obvious to the artisan of ordinary skill to employ a device and method as taught by Dabby in the device and method of McDaniel, since McDaniel provides no particular structure for the fiber optic applicator, or, alternatively, to employ the device and method of McDaniel in the device and method of Dabby, since the device and method of Dabby is tied no particular application, thus producing a device and method such as claimed.”

The Dabby device is a “virtual single mode” fiber having a dual mode but where “the primary mode substantially predominates at the receiver.” Col. 3, lines 16 to 17. The use of the Dabby device is explicitly stated on Col. 1, line 14 to 15, as being in the telecommunications industry, and even in “data processing systems, sensor systems and other communications environments ...” Col. 1, lines 18 to 20. The McDaniel’s invention is directed at “the photomodulation of living tissue ... through the use of narrowband, multichromatic sources of electromagnetic radiation.” Col. 3, lines 26 to 28. Further McDaniel uses LEDs where the “preferred wavelengths include 590 nm, 644 nm, or 810 nm with a bandwidth of at least at least +/- 5 nm.” Col. 3, lines 33 to 35. It is

therefore asserted that there is no reason to use the Dabby device in McDaniel or visa versa.

In contrast to the assertions of the Examiner on page 3, there is particular structures for applicators and, in particular, fiber optic applicators shown by McDaniel. See figures 4, 14, 15, 16 23, 26, and, in particular, figures 19, 20 and 21. Further, Dabby is tied to a particular application area; see above, and therefore, there is no reason to use the optical fiber of Dabby, being dual mode, in an application using multichromatic sources of light energy. There is no technical reason to combine these references.

35 U.S.C. 103(a) REJECTION:

1. Claims 1, 3, 4, 6, 8 and 9 are rejected under 35 U.S.C. §103(a) as being unpatentable over McDaniel in combination with Dabby.

Prior traverses are incorporated by reference.

In particular, the comments noted above as to the combination of McDaniel and Dabby are appropriate to this rejection.

The present invention (Claim 1) comprises (1) at least one coherent light source of a suitable wavelength; (2) at least one oligomode optical waveguide coupled to said source, wherein said waveguide has a low mode transmission at said wavelength; and (3) at least one means to selectively leak irradiation of said wavelength from at least one preselected position along a length of said waveguide so that biological tissue and organisms are caused to be stimulated.

As noted in Claim 1 the light source is a coherent light source that inputs the light into an oligomode optical waveguide having at least one source for leaking radiation along a length of the waveguide to stimulate tissue and/or organisms.

The McDaniel reference notes that the light source is a preferred "multichromatic source" for the treatment of dermalogical conditions. Col. 3, lines 27 and 67. It notes that an optical waveguide may be coupled to the light source such as an LED. Col. 10, line 56 and Figure 17C. Figures 19 and 20 further illustrate the use of optical fibers with

the LEDs. Col. 17, lines 24 to 54. Col. 20, lines 32 to 54, discuss the invention as applied to animal and plant cells to produce collagen. The McDaniel reference fails to disclose a “source for leaking radiation along the length of the waveguide” nor any reason why light loss along the transmission line could possibly not be detrimental to the operation of the McDaniel invention. Rather one skilled in the art would understand that the optical fibers used by the McDaniel reference, behave is standardly understood for optical fibers, in that they output the radiation from a terminal end of the optical fiber and losses along the way would decrease the efficiency of the transmission medium (optical fibers). There is no teaching otherwise.

The points relative to Dabby apply here as well. The optical fiber of Dabby is clearly directed at communication fibers. The McDaniel reference is clearly directed at devices using optical fibers to treat medical conditions. Since neither deal with the benefits or even expect leaks of light along the length of the transmission means, optical fiber, there is no way anyone skilled in the art, foolish enough to attempt mixing Dabby and McDaniel could reasonably reach the invention presented herein.

Clearly there is no motivation to combine these two references, without first having the present invention before them. McDaniel does disclose an optical fiber for transferring light from distant sources to a remote treatment zone, but without any indication or benefit from leaking radiation along the length of the fiber. Dabby discloses single mode fibers but only mentions oligimode fiber in passing, primarily in the context of communications through fiber optics.

As to claim 3, and to claim 4, the above comments are adequate to address this with the added point that multiple ‘leaks’ would definitely be considered even worse than a single leak by those skilled in the art of the two patents.

As to claims 6, 8, 9, biostimulation of organic tissue, the invention is not light stimulation of organic tissue, rather it is the novel, non-obvious fiber optic system of the earlier claims which is useful in achieving the biostimulation that is the invention presented herein, sources of radiation leaks along its length for such stimulation.

2. Claims 2, 5 and 7 are rejected under 35 U.S.C. §103(a) as being unpatentable over McDaniel in combination with Dabby as applied to claims 1, 3 to 4, 6, and 8 to 9, and further in combination with Mori.

The above traverse is incorporated by reference.

Mori discloses a light ray radiation cloth having multiple optical fibers mounted thereon with a plurality of sources of radiation on each fiber for the external treatment of the human body by sun light. Mori does not disclose the use of a coherent source of radiation, does not disclose the use of an oligomode fiber. More significantly the fiber structure and use in Mori is essentially the same as the fibers in McDaniel, i.e. standard fibers with specific output at ends of fibers. Further, as noted in the present invention claim 7, the use of properly designed cladding on the optical fiber can allow for the continuous leaking of radiation along the length of the optical fiber. Mori discloses discrete locations along the fiber only. Other restrictions associated with the Mori design as to placement and flexibility of stimulation sites are simply not present in the present invention.

The Mori reference is directed at the application of sun light through optical fibers held by a cloth or plate or sheet onto selected area of the human body for beauty treatments and for good health as noted on Col. 1, lines 38 to 41.

As seen in Figure 1 of the present invention, a single optical fiber with decouplers is shown for treating wounds. A bandage or like is applied over the wound area for protection. Figure 2 illustrates the invention having a plurality of separate fibers for treating seeds. Figure 3A shows a fiber embedded in the floor of a barn for treating animals. Figure 4 illustrates the use of the fibers for treating seedlings. As seen in these figures the fibers are not attached to any device for holding them in a preferred position but freely associated with the treated object. Claim 1 was amended to indicate that the fibers are freely placed near the treated object which is not possible with Mori in that the emitting portions are fixedly attached to the backing cloth, plate, etc.

It is obvious to one skilled in the art that claims 2, 5 and 7 are not evident from the above art for the reasons noted and thus ought to be patentable over all these references.

3. Claim 10 is rejected under 35 U.S.C. §103(a) as being unpatentable over McDaniel in combination with Dabby as applied to claims 1, 3 to 4, 6, and 8 to 9, and further in combination with Diamantopoulos et al. based on comments on Page 3 of the Office Action.

Cancel 10 has been canceled without prejudice.

4. Claim 11 is rejected under 35 U.S.C. §103(a) as being unpatentable over McDaniel in combination with Dabby and Prescott.

The prior traverse is incorporated by reference.

The “bandage” of Prescott has a plurality of laser/LED sources therein without the use of optical fibers. In principle it is essentially equivalent to McDaniel or Mori as to providing points of application of light from a ‘number’ of sources. It does instruct how a single fiber, especially, a low mode, oligimode fiber can be configured to simulate presenting a multitude of sites for biostimulation. It is the teaching of the present invention only which shows those skilled in the art how a) that this possible and b) what kind of structure is needed to accomplish this.

In claim 11, the optical fiber is placed on the wound before it is covered and both the wound and the fiber are covered by the dressing. None of the references disclose this procedure either singly or in combination.

5. Claim 13 is rejected under 35 U.S.C. §103(a) as being unpatentable over McDaniel in combination with Dabby and further in combination with Sullivan.

The prior traverse is incorporated by reference.

Sullivan merely discloses the use of multiple LEDs sources to treat animals such as humans at a distance and mounted in plates, disks, or other holding devices. Much like Prescott there is no connection to optical fibers. Again multiple sources of light are directed at a wound. Like McDaniel or Mori, even if one did not assume that the latter are not merely another way to achieve the effects claimed by the former two, there is not

teaching how a continuous single fiber whether oligimode or multimode, or singlemode could possibly achieve treatment of multiple sites as presented with the present invention, thus this combination fails to make obvious the key points of the present invention to anyone skilled in the art of optical fibers. They do not disclose or imply that the specific device and method of biostimulation of the present invention could be arrived at without extreme experimentation if one was not already informed as to the present invention.

It is therefore obvious that claim 13 is patentable over this combination.

With these changes and remarks it is believed that the disclosure is now in condition for allowance. The final rejection should be rescinded. Reconsideration is respectfully requested. An early and favorable response is earnestly solicited. Thank you.

Respectfully submitted,



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So far we assume that the fiber is straight, but in any real application, it will bend around corners. In practice, fiber bends are gradual relative to the diameter of a typical step-index fiber core. Larger-core fibers are more rigid and have larger minimum bend radius. To see how a bend can change transmission, recall the simple ray model of transmission and look at figure (doc.2007).

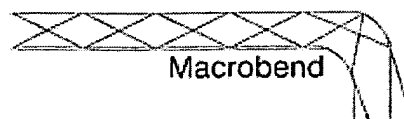
When light rays strike a bend in the fiber, those in higher-order modes can leak out if they hit the side of the fiber at an angle beyond the critical angle θ_c . That increases the loss in the fiber. Lower-order modes are not likely to leak out, but they can be transformed into higher-order modes, which can leak out further along the fiber at the next bend. The bends need not be large to cause losses in the fiber. Indeed, the most serious bending losses in multimode fibers come from microbending, which causes tiny kinks. Typical bend radii should not be less than 2 inches in diameter.

M: Abbreviation for mega. One million or 10^6 .

mA: Abbreviation for milliamp. One thousandth of an Amp or 10^{-3} Amps.

MAC: Abbreviation for multiplexed analog components. A video standard developed by the European community. An enhanced version, HD-MAC delivers 1250 lines at 50 frames per second, HDTV quality.

Macrobending: In a fiber, all macroscopic deviations of the fiber's axis from a straight line, that will cause light to leak out of the fiber, causing signal attenuation.



MAN (Metropolitan Area Network): A network covering an area larger than a local area network. A series of local area networks, usually two or more, that cover a metropolitan area.

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lateral load test A method of measuring microbending losses in optical fiber by sandwiching a length of fiber between two parallel plates, with 150-grit sandpaper on the bottom plate. Different weights are placed on the top plate, and attenuation vs. load is measured.

lateral magnification See magnification.

lateral mode In a diode laser, a mode in the plane of the active layer that is perpendicular to the direction of the emitted beam.

lateral offset loss A power loss caused by transverse or lateral deviation from optimum alignment of source to optical waveguide, waveguide to waveguide, or waveguide to detector.

lateral vision The perception of visual stimuli at the left and right outer boundaries of the visual field.

lateral wave Light generated along the interface when light is incident in the neighborhood of the total internal reflection angle.

lattice A regular spatial display of points representing, for example, the sites of atoms in a crystal.

lattice constant A length that denotes the size of the unit cell in a crystal lattice. With respect to the cubic crystal, this is the length of the side of the unit cell. However, a simple definition of the term is difficult, and the lattice constant must be considered with the geometry of the structure in each case.

lattice energy With respect to the crystal, the decrease in energy that follows the process whereby the ions, separated from each other by an infinite distance, are brought to their locations in the stable lattice. The lattice energy is formed from the electrostatic forces between ions, the repulsive forces connected with the overlap of electron shells, from the Van der Waals forces, and from the zero-point energy.

Lane pattern The photographic record of the diffracted beams formed when heterogeneous x-rays emerging from a pinhole or slit impinge upon one crystal.

launch angle The angle between the light input propagation vector and the optical axis of an optical fiber or fiber bundle.

launching fiber A fiber used in conjunction with a source to excite the modes of another fiber in a particular fashion.

launch numerical aperture (LNA) The numerical aperture of an optical system used to couple (launch) power into an optical waveguide.

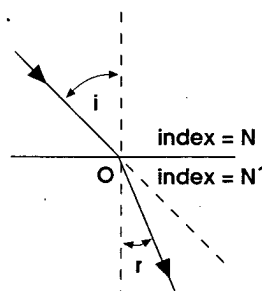
Laurent half-shade plate A half-wave plate made of quartz or some other crystal that is used in a polarimeter to cause a shift in rotation in the beam of polarized light being analyzed.

law of Beer See Beer's law.

law of Brewster The law stating that when light strikes a surface at such an angle that the reflected and refracted rays are perpendicular to each other, the maximum polarization of the light occurs in both reflected and refracted rays. The maximum polarization in the reflected ray is perpendicular to the plane containing the ray and normal to the surface, and therefore perpendicular to the refracted ray that lies in this plane.

law of reflection The law stating that the angle of reflection is equal to the angle of incidence, the incident ray, reflected ray and normal to the surface, all being located in the same plane.

law of refraction, Snell's The incident ray, the normal to the refracting surface at the point of incidence of the ray at the surface, and the refracted ray all lie in a single plane. The ratio of the sine of the angle between the normal and the incident ray to the sine of the angle between the normal and refracted ray is a constant. If the indices of refraction on either side of a refracting surface are N and N' , and the angles that a ray makes with the surface normal are i and r , then Snell's law states that $N \sin i = N' \sin r$.



LAW OF REFRACTION

$$N \sin i = N' \sin r$$

law of reversibility The law stating that if the direction of a light beam is reversed, despite the number of times the beam is reflected or refracted, it will follow the same path.

Lawson criterion Defines the minimum operational standards for a self-sustaining fusion reactor as equivalence between energy released per volume unit and kinetic energy per unit volume.

layout In the optical shop, the process of positioning and marking a blank or lens before surfacing, cutting and edging.

leaching The process of removing some of the constituents of a glass surface by chemical action.

lead selenide (PbSe) cell A thin-film photoconductive cell that is sensitive to the infrared region. The photosensitive material of the cell is composed of lead selenide, and the cell is used in the detection of infrared radiation.

lead sulfide (PbS) cell A photoconductive cell having greatest sensitivity in the infrared region. The photosensitive material of the cell is lead sulfide, which is deposited on a glass plate.

lead zirconate titanate A ferroelectric polycrystalline ceramic material used in optical memories for computers and as a piezoelectric transducer.

leaky mode In an optical waveguide, a mode whose field decays monotonically for a finite distance in the transverse direction but which becomes oscillatory everywhere beyond that finite distance.

leaky ray In an optical waveguide, a ray for which geometric optics would predict total internal reflection at the core boundary, but which suffers loss by virtue of the curved core boundary.

least circle of confusion The circle of confusion is a defocused or aberrated image of a point. Focus is generally set where the diameter of this circle is minimized or least.

LED See light-emitting diode.

leman prism An erecting prism that inverts and reverses the image. It displaces the optical axis but does not deviate it.

Lenard tube An electron-beam tube designed so that the beam can be carried through a portion of the wall of an evacuated enclosure.

lens A transparent optical component consisting of one or more pieces of optical glass with surfaces so curved (usually spherical) that they serve to converge or diverge the transmitted rays from an object, thus forming a real or virtual image of that object.

lens barrel The mechanical structure that holds a number of individual lens elements.

lens bench See optical bench.

lens disc A rotating disc that holds several lenses of differing focal length about a diameter. Used to switch lenses in a system while maintaining focus.

lens element One optical element of a multielement lens. See optical element.

lensless Fourier transform hologram A hologram formed without lenses and with the object and reference points sharing the same plane. In the initial recording, each object point produces fringes having one spatial frequency across the recording medium. Reconstruction of the hologram, using a diverging illuminating beam, produces primary and conjugate images, both being virtual.

lenslets A matrix of miniature lenses, molded or formed onto a common base.

lens measure A tool used to determine the curvature of a lens surface in terms of dioptric power. See lens watch; spherometer.

lens meridian A line passing through the center of a lens surface, from edge to edge.

lens molding The production of rough glass lens blanks that are pressed while red-hot to the approximate size and shape of the finished lens, ready for fine grinding and polishing. Large companies often do their own molding, but it is common for smaller factories to use only blanks that have been made to order by an independent supplier.

lens mount The metal tube that maintains the optical components of a lens in proper relationship. Some lenses are mounted in metal cells, which in turn are screwed to the front and rear of a shutter or lens barrel. A lens mount often contains a central iris diaphragm to control the aperture. Some lens mounts are equipped with a threaded focusing device to move the whole lens, or with a provision for focusing by a longitudinal movement of the front element.

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